

Attorney Docket No.: 02SPE133P

In the Claims:

Claim 1 (currently amended): A method of forming a varactor device on a semiconductor substrate, comprising the steps of:

forming a buried layer in said semiconductor substrate, said semiconductor substrate having a first conductivity type and said buried layer having a second conductivity type;

providing an epitaxial layer situated in said semiconductor substrate, ~~said semiconductor substrate having a first conductivity type and said epitaxial layer having a second~~said first conductivity type, wherein said epitaxial layer is situated over said buried layer;

providing an isolation structure on said semiconductor substrate, said isolation structure defining an implant region, said implant region being situated over said epitaxial layer;

selecting a first peak dopant concentration and a first implant energy such that at least one of capacitance, leakage current, and tuning range of the varactor device is optimized;

forming a first implant in said epitaxial layer using said first implant energy, said first implant having said first peak dopant concentration and said ~~second~~first conductivity type, wherein said first implant extends into said epitaxial layer a first distance, and wherein said first implant is situated over said buried layer;

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forming a second implant in said epitaxial layer using a second implant energy, said second implant having a second peak dopant concentration and said ~~second~~first conductivity type, wherein said second implant extends into said epitaxial layer a second distance, wherein said second distance is greater than said first distance, wherein said second implant is situated over said buried layer,

and wherein said second implant has a depth that is more than twice a depth of said first implant.

Claim 2 (original): A method in accordance with claim 1, further comprising the step of annealing the device following the steps of forming said first implant and said second implant.

Claim 3 (canceled).

Claim 4 (previously presented): A method in accordance with claim 1, wherein said selecting step comprises determining an as-implanted dopant concentration profile for said first implant.

Claim 5 (original): A method in accordance with claim 4, wherein said step of determining an as-implanted dopant concentration profile is performed using secondary ion mass spectroscopy.

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Claim 6 (original): A method in accordance with claim 1, further comprising the step of selecting said second peak dopant concentration and said second implant energy such that the base resistance of the varactor device is minimized.

Claim 7 (original): A method in accordance with claim 6, wherein said selecting step comprises determining an as-implanted dopant concentration profile for said second implant.

Claim 8 (original): A method in accordance with claim 7, wherein said step of determining an as-implanted dopant concentration profile is performed using secondary ion mass spectroscopy.

Claim 9 (currently amended): A method of forming a varactor device on a semiconductor substrate, comprising the steps of:

forming a buried layer in said semiconductor substrate, said semiconductor substrate having a first conductivity type and said buried layer having a second conductivity type;

providing an epitaxial layer situated in said semiconductor substrate, ~~said semiconductor substrate having a first conductivity type and said epitaxial layer having a~~

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~~second~~said first conductivity type, wherein said epitaxial layer is situated over said buried layer;

providing an isolation structure on said semiconductor substrate, said isolation structure defining an implant region, said implant region being situated over said epitaxial layer;

forming a first implant in said epitaxial layer using a first implant energy, said first implant having a first peak dopant concentration and said ~~second~~first conductivity type, wherein said first implant extends into said epitaxial layer a first distance, and wherein said first implant is situated over said buried layer;

forming a second implant in said implant region of said isolation structure using a second implant energy, said second implant having a second peak dopant concentration and said ~~second~~first conductivity type, wherein said second implant extends into said epitaxial layer a second distance, wherein said second implant is situated over said buried layer,

wherein said second distance is greater than said first distance, wherein said first peak dopant concentration and said first implant energy are selected such that at least one of capacitance, leakage current, and tuning range of the varactor device are optimized, and wherein said second peak dopant concentration and said second implant energy are selected with relation to said first peak dopant concentration and said first implant energy such that the base resistance of the varactor device is minimized,

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and wherein said second implant has a depth that is more than twice a depth of said first implant.

Claims 10-16 (canceled).

Claim 17 (previously presented): A method in accordance with claim 1, further comprising the step of forming a contact layer of said first conductivity type overlying said first implant.

Claim 18 (canceled).

Claim 19 (previously presented): A method in accordance with claim 1 wherein said step of providing an isolation structure comprises providing an isolation structure including a CMOS well.

Claim 20 (previously presented): A method in accordance with claim 9 further comprising the step of forming a contact layer of said first conductivity type overlying said first implant.

Claim 21 (canceled).

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Claim 22 (previously presented): A method in accordance with claim 9 wherein said step of providing an isolation structure comprises providing an isolation structure including a CMOS well.

Claim 23-25 (canceled)

Claim 26 (currently amended): A method of forming a varactor device on a semiconductor substrate, comprising steps of:

forming a buried layer in said semiconductor substrate, said semiconductor substrate having a first conductivity type and said buried layer having a second conductivity type;

providing an epitaxial layer situated in said semiconductor substrate, said semiconductor substrate having a first conductivity type and said epitaxial layer having a second said first conductivity type, wherein said epitaxial layer is situated over said buried layer;

selecting a first peak dopant concentration and a first implant energy such that at least one of capacitance, leakage current, and tuning range of the varactor device is optimized;

forming a first implant in said epitaxial layer using said first implant energy, said first implant having said first peak dopant concentration and a second said first

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conductivity type, wherein said first implant extends into said epitaxial layer a first distance, and wherein said first implant is situated over said buried layer;

forming a second implant in said epitaxial layer using a second implant energy, said second implant having a second peak dopant concentration and said ~~second~~first conductivity type, wherein said second implant extends into said epitaxial layer a second distance, wherein said second distance is greater than said first distance, wherein said second implant is situated over said buried layer,

and wherein said second implant has a depth that is more than twice a depth of said first implant.

Claim 27 (previously presented): A method in accordance with claim 26, further comprising the step of forming a contact layer of said first conductivity type overlying said first implant.

Claim 28 (canceled).

Claim 29 (previously presented): A method in accordance with claim 26, further comprising the step of annealing the device following the steps of forming said first implant and said second implant.

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Claim 30 (canceled).

Claim 31 (previously presented): A method in accordance with claim 26, wherein said selecting step comprises determining an as-implanted dopant concentration profile for said first implant.

Claim 32 (previously presented): A method in accordance with claim 31, wherein said step of determining an as-implanted dopant concentration profile is performed using secondary ion mass spectroscopy.

Claim 33 (previously presented): A method in accordance with claim 26, further comprising the step of selecting said second peak dopant concentration and said second implant energy such that the base resistance of the varactor device is minimized.

Claim 34 (previously presented): A method in accordance with claim 33, wherein said selecting step comprises determining an as-implanted dopant concentration profile for said second implant.

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Claim 35 (currently amended): A method of forming a varactor device on a semiconductor substrate, comprising the steps of:

forming a buried layer in said semiconductor substrate, said semiconductor substrate having a first conductivity type and said buried layer having a second conductivity type;

providing an epitaxial layer situated in said semiconductor substrate, ~~said semiconductor substrate having a first conductivity type and said epitaxial layer having a second~~said first conductivity type;

forming a first implant in said epitaxial layer using a first implant energy, said first implant having a first peak dopant concentration and ~~a second~~said first conductivity type, wherein said first implant extends into said epitaxial layer a first distance, and wherein said first implant is situated over said buried layer;

forming a second implant in said epitaxial layer using a second implant energy, said second implant having a second peak dopant concentration and said ~~second~~first conductivity type, wherein said second implant is situated over said buried layer,

wherein said second distance is greater than said first distance, wherein said first peak dopant concentration and said first implant energy are selected such that at least one of capacitance, leakage current, and tuning range of the varactor device are optimized, wherein said second peak dopant concentration and said second implant energy are

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selected with relation to said first peak dopant concentration and said first implant energy such that the base resistance of the varactor device is minimized,

and wherein said second implant has a depth that is more than twice a depth of said first implant.

Claim 36 (previously presented): A method in accordance with claim 35 further comprising the step of forming a contact layer of said first conductivity type overlying said first implant.

Claims 37-44 (canceled)